



TENNESSEE DEPARTMENT OF

EDUCATION
FIRST TO THE TOP

Pharmacological Sciences

Primary Career Cluster:	Health Science
Consultant:	Amy F. Howell, (615) 532-2839, Amy.F.Howell@tn.gov
Course Code:	6133
Prerequisite(s):	<i>Health Science Education</i> (5998) and <i>Chemistry I</i> (3221) (pre- or co-requisite)
Credit:	1
Grade Level:	11-12
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Health Science courses.
Programs of Study and Sequence:	This is one of several options available as the third course in the <i>Therapeutic Clinical Services</i> program of study.
Aligned Student Organization(s):	HOSA: http://www.tennesseehosa.org Amanda Hodges, (615) 532-6270, Amanda.Hodges@tn.gov
Coordinating Work-Based Learning:	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visit http://tn.gov/education/cte/work_based_learning.shtml .
Available Student Industry Certifications:	Students who have also completed a <i>Clinical Internship</i> can apply to sit for the Pharmacy Technician Certification Board examination immediately after high school graduation.
Dual Credit or Dual Enrollment Opportunities:	There are no known dual credit/dual enrollment opportunities for this course. If interested in developing, reach out to a local postsecondary institution to establish an articulation agreement.
Teacher Endorsement(s):	577, 720
Required Teacher Certifications/Training:	None
Teacher Resources:	http://www.tn.gov/education/cte/HealthScience.shtml

Course Description

Pharmacological Sciences is a third-level applied course in the *Therapeutic Clinical Services* program of study intended to prepare students with an understanding of the roles and responsibilities of the healthcare worker in a pharmacy setting. This course equips students with the communication, goal-

setting, and information-processing skills to be successful in the workplace, in addition to covering key topics in pharmacology, pharmacy law and regulations, sterile and non-sterile compounding, medication safety, quality assurance, and more. Upon completion of this course, proficient students who have also completed a *Clinical Internship* can apply to sit for the Pharmacy Technician Certification Board examination immediately after high school graduation. Standards in this course are aligned with Tennessee State Standards for English Language Arts & Literacy in Technical Subjects, Tennessee State Standards in Mathematics, and Tennessee state standards in Anatomy and Physiology.*

Program of Study Application

This is the third course in the *Therapeutic Clinical Services* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the Health Science website at <http://www.tn.gov/education/cte/HealthScience.shtml>.

Course Standards

Pharmacology for Technicians

- 1) Receive and screen prescription/medication orders for completeness and authenticity, identifying generic and name brands of pharmaceuticals, strengths/dose, dosage form, physical appearance, route of administration, and duration of drug therapy. Develop an informative brochure explaining the top 200 medications per the criteria previous listed. (TN Reading 4; TN Writing 2, 6; PTCB Knowledge Domain 1.1, 1.4)
- 2) Construct a teaching plan for an elderly community person explaining definitions of various drug interactions (such as drug-disease, drug-drug, drug-dietary supplement, drug-OTC, drug-laboratory, and drug-nutrient). (TN Reading 1, 4, 9; TN Writing 8, 9; PTCB Knowledge Domain 1.3)
- 3) Compare and contrast the principles of pharmaceutical equivalents, generic equivalence, bioequivalence, pharmaceutical alternatives, and therapeutic equivalents as defined by the U.S Food and Drug Administration (FDA). Summarize the criteria for deeming a product therapeutically equivalent. (TN Reading 1, 2, 9; TN Writing 8, 9; PTCB Knowledge Domain 1.2)
- 4) Differentiate between common and severe side effects or adverse effects, allergies, and therapeutic contraindications associated with the top 200 medications as published in pharmaceutical print and online journals. (TN Reading 1, 2, 4, 9; TN Writing 9; PTCB Knowledge Domain 1.5)
- 5) Research the basic chemical properties, physical properties, dosages, and indications of legend for selected over-the-counter (OTC) drugs and herbal and dietary supplements. Illustrate findings in an oral, visual, or digital presentation, citing information obtained from print and online medical sites such as the U.S. National Library of Medicine databases. (TN Reading 1, 2, 4, 9; TN Writing 6, 8, 9; PTCB Knowledge Domain 1.6)

Pharmacy Law and Regulations

- 6) Design an action plan for a pharmacy related to the storage, handling, and disposal of hazardous substances and wastes (e.g., MSDS) with inclusion of procedures for prevention and treatment of hazardous substances exposure (e.g., eyewash, spill kit, MSDS). (TN Reading 2, 4; TN Writing 8, 9; PTCB Knowledge Domain 2.1, 2.2)
- 7) Evaluate the Drug Enforcement Administration (DEA) rules and regulations surrounding the transfer of controlled substances, verification of a prescriber's DEA number, and documentation requirements for receiving, ordering, returning, loss/theft, and destruction of controlled substances. Investigate the standards of practice of record keeping for repackaged and recalled products and supplies, including the FDA's recall classification. Summarize findings in an oral, written, or digital presentation. (TN Reading 2, 4; TN Writing 4, 6, 7, 8, 9; PTCB Knowledge Domain 2.3, 2.4, 2.5, 2.10, 2.12)
- 8) Gather data from Tennessee pharmaceutical board rules and regulations documents concerning record keeping, documentation, and record retention of prescriptions (e.g., length of time prescriptions are maintained on file). List the requirements for restricted drug programs and related prescription processing (e.g., for medications such as thalidomide, isotretinoin, and clozapine). (TN Reading 2, 4; TN Writing 8, 9; PTCB Knowledge Domain 2.6, 2.7)
- 9) Summarize professional standards related to data integrity and security and Health Insurance Portability and Accountability Act (HIPAA) guidelines. Using domain-specific language and accurate definitions of legal concepts, explain how these areas impact patients' rights for all aspects of pharmaceutical care. (TN Reading 1, 2, 4, 5; TN Writing 8, 9; PTCB Knowledge Domain 2.8)
- 10) In a lab/clinical setting, demonstrate application of concepts and skills of asepsis, Universal Precautions, sanitation, disinfection, and sterilization for pharmacy settings in adherence to standards and guidelines from the Centers for Disease Control and Prevention (CDC) and the Occupational Safety and Health Administration (OSHA). Perform or check for functions such as proper laminar air flow, hand washing, ensuring a clean room or workspace, and cleaning of counting trays, countertops, and equipment. (TN Reading 2, 3, 4, 5; TN Writing 8, 9; PTCB Knowledge Domain 2.11)
- 11) Research the professional standards and state and federal laws regarding the roles and responsibilities of pharmacists, pharmacy technicians, and other pharmacy employees; describe when a pharmacist should provide consultation for a patient/client. (TN Reading 1, 2; TN Writing 8, 9; PTCB Knowledge Domain 2.9, 2.13, 2.14)
- 12) Formulate a list of facility, equipment, and supply requirements (e.g., space requirements, prescription file storage, cleanliness, and reference materials) required for a retail pharmacy as compared with a hospital-based pharmacy. (TN Reading 1, 8, 9; TN Writing 6, 8, 9; PTCB Knowledge Domain 2.15)

- 13) Develop an informative essay based on research of state and federal laws surrounding a pharmacist/pharmacy technician's roles and responsibilities for detecting prescription abuse. List specific legislation passed or currently in development in Tennessee meant to regulate the purchase of certain over-the-counter medications, such as pseudoephedrine. (TN Reading 1, 2, 5, 6, 7, 8; TN Writing 2, 4, 9; PTCB Knowledge Domain 2.14)

Sterile and Non-Sterile Compounding

- 14) Research and identify infection control standards utilized in a pharmacy compounding department as established by the CDC and OSHA. Demonstrate application of skills in lab/classroom/clinical setting in order to meet the standards identified. (TN Reading 2, 3, 4; TN CCS Writing 9; PTCB Knowledge Domain 3.1)
- 15) Demonstrate the following skills surrounding compounding:
- a. Handling and disposal requirements (e.g., receptacles, waste streams)
 - b. Documentation (e.g., batch preparation, compounding record)**
 - c. Determination of product stability (e.g., beyond-use dating, signs of incompatibility)**
 - d. Selection and use of equipment and supplies
 - e. Sterile compounding processes**
 - f. Non-sterile compounding processes
- (TN Reading 3; TN Writing 4; TN Math N-Q; PTCB Knowledge Domain 3.2, 3.3, 3.4, 3.5, 3.6, 3.7)

Medication Safety

- 16) Outline in a written or digital presentation industry standards surrounding medication safety. Cite information obtained from textbooks, online and print pharmacy journals, and related websites. Include at minimum the following:
- a. Error prevention strategies for data entry (e.g., prescription or medication order to correct patient)
 - b. Patient package insert and medication guide requirements (e.g., special directions and precautions)
 - c. Issues that require pharmacist intervention (e.g., DUR, ADE, OTC recommendation, therapeutic substitution, misuse, missed dose)
 - d. Common safety strategies (e.g., tall man lettering, separating inventory, leading and trailing zeroes, limited use of error-prone abbreviations)
- (TN Reading 1, 2, 7; TN Writing 4, 6, 9; PTCB Knowledge Domain 4.1, 4.2, 4.3, 4.6)
- 17) Identify strategies for preventing medication errors by distinguishing medications that either look alike or sound alike, such as Ceftin, Cefotan, Cefzil, Rocephin and Cipro. Include strategies related to recognizing high-alert/high-risk medications such as Sporanox for patients who have ventricular dysfunction. (TN Reading 2, 4, 6, 8; TN Writing 8, 9; PTCB Knowledge Domain 4.4, 4.5)

Pharmacy Quality Assurance

- 18) Interpret quality assurance practices for medication and inventory control systems (e.g., matching National Drug Code (NDC) number, bar code, and data entry) and for infection control

procedures and documentation (e.g., personal protective equipment [PPE], needle recapping). (TN Reading 3, 4; TN Writing 9; PTCB Knowledge Domain 5.1, 5.2)

- 19) Explain the common assurance measures used to monitor quality in a pharmacy. For example, explain risk management guidelines and regulations (e.g., error prevention strategies), communication channels necessary to ensure appropriate follow-up and problem resolution (e.g., product recalls, shortages), and productivity, efficiency, and customer satisfaction measures. Summarize information gathered from textbooks, retail pharmacy websites, print pharmacy journals, and/or personal interviews of pharmacists or pharmacy technicians. (TN Reading 2, 9; TN Writing 4, 9; PTCB Knowledge Domain 5.3, 5.4, 5.5)

Medication Order Entry and Fill Process

- 20) Identify all information a pharmacist or pharmacy technician should obtain from the patient/client before filling and dispensing any medication related to intake, interpretation, and data entry.** Information should include at minimum: name of patient/client, date of birth, address, insurance policy, physician's name, and any drug allergies. Practice interviewing skills in a lab/clinical/classroom setting. (TN Reading 3; TN Math N-Q; PTCB Knowledge Domain 6.2)
- 21) Create either an electronic or paper profile detailing the order entry process** per industry standards for each of the following: a hospital, a free-standing pharmacy, and a retail-based pharmacy. (TN Reading 3, 4; TN Writing 4, 9; TN Math N-Q; PTCB Knowledge Domain 6.1)
- 22) Calculate correct doses required when given a simulated prescription for a pediatric dose, adult dose, and geriatric dose based on weight (if applicable), length of administration, times per day of administration, and presence of other diseases/disorders.** (TN Reading 3, 7; TN Math N-Q, A-CED; PTCB Knowledge Domain 6.3)
- 23) Demonstrate the following skills of the prescription fill process:
- a. Select appropriate product
 - b. Apply special handling requirements
 - c. Measure and prepare product for final check
- (TN Reading 3; PTCB Knowledge Domain 6.4)
- 24) Demonstrate the following skills of prescription labeling requirements :
- a. Auxiliary and warning labels
 - b. Expiration date
 - c. Patient-specific information
- (TN Reading 3; PTCB Knowledge Domain 6.5)
- 25) Demonstrate the following skills of prescription packaging requirements:
- a. Type of bags
 - b. Syringes
 - c. Glass
 - d. PVC
 - e. Child resistant
 - f. Light resistant**
- (TN Reading 3; TN Math N-Q; PTCB Knowledge Domain 6.6)

- 26) Demonstrate the following skills of the dispensing process:
- a. Validation of prescription with pharmacist
 - b. Documentation and distribution
- (TN Reading 3; TN Writing 4; PTCB Knowledge Domain 6.7)

Pharmacy Inventory Management

- 27) Distinguish between the functions and applications of NDC number, lot numbers, and expiration dates of inventory found in a pharmacy. Articulate the importance of this information as it relates to protecting the safety of the public. (TN Reading 2, 4, 7, 8; PTCB Knowledge Domain 7.1)
- 28) Define the concept of a formulary or approved/preferred product list. Research at least three different insurance companies for a listing of their approved formulary drug list. Compare and contrast the three lists with the top 200 drugs identified earlier in this course. Explain how the phrases “Dispense as Written” or “Do Not Substitute” can affect the formulary. Synthesize research into an informative essay. (TN Reading 1, 2, 4, 8, 9; TN Writing 2, 8, 9; PTCB Knowledge Domain 7.2)

Pharmacy Billing and Reimbursement

- 29) Role-play explaining the reimbursement policies and plans (e.g., HMOs, PPO, CMS, private plans) to a patient/client who has presented a prescription for three of the top 200 drugs. Ensure the accurate explanation of relevant third-party resolution issues (e.g., prior authorization, rejected claims, plan limitations)** and third-party reimbursement systems (e.g., PBM, medication assistance programs, coupons, and self-pay). (TN Reading 2, 9; TN Writing 4, 9; TN Math N-Q; PTCB Knowledge Domain 8.1, 8.2, 8.3)
- 30) Compare and contrast healthcare reimbursement systems in home health, long-term care, and home infusion. Develop a technology-enhanced presentation to share information with classmates, healthcare professionals, or pharmacy staff. (TN Reading 6, 9; TN Writing 6, 8, 9; PTCB Knowledge Domain 8.4, 8.5)

Pharmacy Information System Usage and Application

- 31) Research common software and databases used by pharmacies to manage electronic medical records and prescriptions. Understand the uses and capabilities of these programs as they relate to the roles and responsibilities of the pharmacy technician. (TN Reading 4, 7; PTCB Knowledge Domain 9.1, 9.2)

Standards Alignment Notes

*References to other standards include:

- TN Reading: [State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects](#); Reading Standards for Literacy in Science and Technical Subjects 6-12; Grades 11-12 Students (page 62).
 - Note: While not directly aligned to one specific standard, students who are engaging in activities outlined above should be able to also demonstrate fluency in Standard 10 at the conclusion of the course.
- TN Writing: [State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects](#); Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects 6-12; Grades 11-12 Students (pages 64-66).
 - Note: While not directly aligned to one specific standard, students who are engaging in activities outlined above should be able to also demonstrate fluency in Standards 1, 3, 5 and 10 at the conclusion of the course.
- TN Math: [State Standards for Mathematics](#); Math Standards for High School: Number and Quantity, Algebra.
 - Note: The standards in this course are not meant to teach mathematical concepts. However, the concepts referenced above may provide teachers with opportunities to collaborate with mathematics educators to design project-based activities or collaborate on lesson planning. Students who are engaging in activities listed above should be able to demonstrate quantitative and algebraic reasoning as applied to specific technical concepts. In addition, students will have the opportunity to practice the habits of mind as described in the eight Standards for Mathematical Practice.
- TN A&P: Tennessee Department of Education Curriculum Standards, Secondary 9-12 Science, [Human Anatomy & Physiology](#).
 - Note: While not directly aligned to one specific standard, students who are engaging in activities outlined above should be able to also demonstrate fluency in Tennessee Anatomy & Physiology Standard 6 at the conclusion of the course.
- PTCB Knowledge Domain: [Pharmacy Technician Certification Exam \(PTCE\) Blueprint](#). The PTCE content was developed nationally by experts in pharmacy technician practice based on a national job analysis study. The updated blueprint is the basis for the PTCE effective November 2013.
- P21: Partnership for 21st Century Skills [Framework for 21st Century Learning](#)
 - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

Additional Standards Notes

**Refers to standards that will require dosage calculations.